AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply of approximately 12VDC or less to a high voltage from approximately 140VDC to approximately 280VDC; and

an amplification means driven by the high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier.

2. (original) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave; and

control means for implementing variable frequency control over three or more different frequencies at the time of activation of said sine wave oscillation means.

3. (previously presented) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage ;

an amplification means composed of a D-class amplifier driven by high voltage generated by said voltage-boosting means for subjecting a signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification, and a low-pass filter for demodulating the output signal of said D-class amplifier; said amplification means being driven at high voltage generated by said voltage-boosting means and amplifying the signal supplied as output from said sine wave oscillation means for driving said piezoelectric element by a high-voltage sine wave; and

a control means for implementing variable frequency control over three or more different frequencies at the time of activation of said sine wave oscillation means.

4. (currently amended) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means composed of a D-class amplifier driven by high voltage generated by said voltage-boosting means for subjecting a signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification , and low-pass filter for demodulating the output signal of said D-class amplifier; said amplification means being driven at high voltage generated by said voltage-boosting means and amplifying the signal supplied as output from said sine wave oscillation means for driving said piezoelectric element by a high-voltage sine wave;

a temperature sensing means for sensing temperature of a heat-generating body; and

a control means for one of increasing ~~or decreasing~~ the signal amplitude of said sine wave oscillation means ~~in accordance with corresponding~~ when the temperature of the heat-

generating body is increased ~~or~~ and decreasing the signal amplitude of the sine wave oscillation means when the ~~decreased sensed~~ temperature of said heat-generating body is decreased, based on the sensed temperature.

5. (currently amended) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a temperature sensing means for sensing temperature of a heat-generating body; and

a control means for one of increasing ~~or decreasing~~ the signal amplitude of said sine wave oscillation means ~~in accordance with corresponding~~ when the temperature of the heat-generating body is increased ~~or~~ and decreasing the signal amplitude of said sine wave oscillation means when the ~~decreased sensed~~ temperature of said heat-generating body is decreased, based on the sensed temperature;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier.

6. (original) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means.

7. (original) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier.

8. (currently amended) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply of approximately 12VDC or less to a high voltage from approximately 140VDC to

approximately 280VDC; and

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

9. (original) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave; and

control means for implementing variable frequency control over three or more different frequencies at the time of activation of said sine wave oscillation means;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and

said radiator;

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

10. (original) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave; and

a control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

11. (currently amended) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency

that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a temperature sensing means for sensing temperature of a heat-generating body; and

a control means for one ~~of~~ increasing ~~or decreasing~~ the signal amplitude of said sine wave oscillation means ~~in accordance with corresponding~~ when the temperature of the heat-generating body is increased ~~or~~ and decreasing the signal amplitude of the sine wave oscillation means when the ~~decreased sensed~~ temperature of said heat-generating body is decreased, based on the sensed temperature;

a heat sink that contacts the heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

12. (currently amended) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a temperature sensing means for sensing temperature of a heat-generating body; and

a control means for one of increasing ~~or decreasing~~ the signal amplitude of said sine wave oscillation means ~~in accordance with corresponding~~ when the temperature of said heat-generating body is increased ~~or~~ and decreasing the signal amplitude of said sine wave oscillation means when the ~~decreased sensed~~ temperature of said heat-generating body is decreased, based on the sensed temperature;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts the heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

13. (original) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

14. (original) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass

filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

15. (new): The piezoelectric pump drive circuit according to claim 2, further comprising:

a power supply which supplies voltage to the sine wave oscillation means to activate the sine wave oscillation means; and

a voltage detection circuit which detects when the voltage to the sine wave oscillation means is supplied at power up and provides a signal to the control means indicative of a detection of voltage.

16. (new): The piezoelectric pump drive circuit according to claim 15, wherein the control means implements the variable frequency control over three or more different frequencies at the time of activation of the sine wave oscillation means based on the provided signal.

17. (new): The piezoelectric pump drive circuit according to claim 16, further comprising:

a temperature sensing means for sensing temperature of a heat generating body, which is different from the piezoelectric element; and

another control means for adjusting signal amplitude of the sine wave oscillation means based on the sensed temperature.

18. (new): The piezoelectric pump drive circuit according to claim 2, wherein the voltage-boosting means converts the low-voltage power supply to the high voltage from

approximately 140VDC to approximately 280VDC.